Attorney Docket: 3036/50289
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: STEPHEN McCANN ET AL.

Serial No.: NOT YET ASSIGNED

Filed: SEPTEMBER 24, 2001

Title: ACCESS AUTHENTICATION SYSTEM

CLAIM FOR PRIORITY UNDER 35 U.S.C. §119

Box PATENT APPLICATION September 24, 2001
Commissioner for Patents
Washington, D.C. 20231

Sir:

The benefit of the filing date of prior foreign application No. 0023270.2, filed in Great Britain on 22 September 2000, is hereby requested and the right of priority under 35 U.S.C. §119 is hereby claimed.

In support of this claim, filed herewith is a certified copy of the original foreign application.

Respectfully submitted,

Gary R. Edwards
Registration No. 31,824

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September 24, 2001

Box PATENT APPLICATION
Commissioner for Patents
Washington, D.C. 20231

Re: New U.S. Patent Appln.
Our Ref: **3036/50289**

Sir:

Transmitted herewith for filing is the patent application of:

Stephen McCANN; Robert HANCOCK; John MAY; and Michael HOOK

entitled: **ACCESS AUTHENTICATION SYSTEM**

Enclosed are:

1. Specification, including 10 claims (pages 1-14).

2. 2 Sheets of drawings showing Figs. 1 and 2.

3. X Declaration and Power of Attorney **(executed/2 pages)**.

4. Assignment of the invention to Roke Manor Research Limited.

5. Certified copy of Priority Document 0023270.2 filed in Great Britain on 22 September 2000, the priority of which is being claimed under 35 U.S.C. §119 and 37 C.F.R. §1.55.

6. X Preliminary Amendment.

7. The filing fee has been calculated as shown below after entry of Preliminary Amendment:

Basic Fee						$355/710	= $710.00
Total Claims	9	-	20	= 0	x	$9/18	= $
Independent Claims	1	-	3	= 0	x	$40/80	= $
Multiple Dependent Claim Presented						$135/270	= $
Total Filing Fee							$710.00

Two checks in the amount of $ 710.00 for the filing fee and $40.00 for the assignment recording fee are enclosed. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 05-1323 (Docket #3036/50289). A duplicate copy of this sheet is enclosed.

Respectfully submitted,

Gary R Edwards

Gary R. Edwards
Registration No. 31,824

GRE:kms
(CAM 38819.050)

The Patent Office

INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

Dated: 7 August 2001

CERTIFIED COPY OF PRIORITY DOCUMENT

Patents Form 1/77

Patents Act 1977
(Rule 16)

THE PATENT OFFICE
22 SEP 2000

The Patent Office

22SEP00 E570379-1 D00393
P01/7700 0.00-0023270.2

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference

2000P04860/GB/R76/AN/cs

2. Patent ap... *(The Pate...*

0023270.2

22 SEP 2000

3. Full name, address and postcode of the ... each applicant *(underline all surnames)*

Roke Manor Research Limited
Roke Manor
Romsey
Hampshire
SO51 0ZN

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

5615455002

4. Title of the invention

ACCESS AUTHENTICATION SYSTEM

5. Name of your agent *(if you have one)*

ANDREW NEILL

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Siemens Shared Services Limited
Intellectual Property Department
Siemens House, Oldbury
Bracknell, Berkshire RG12 8FZ
United Kingdom

Patents ADP number *(if you know it)*

7986375001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

YES

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	10
Claim *(s)*	3
Abstract	1
Drawing *(s)*	2+2 P6

10. If you are also filing any of the following, state how many against each item.

Priority documents	0
Translations of priority documents	0
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	5
Request for preliminary examination and search *(Patents Form 9/77)*	1
Request for substantive examination *(Patents Form 10/77)*	0
Any other documents *(please specify)*	0

11. I/~~We~~ request the grant of a patent on the basis of this application.

Signature A. Neill Date 21/09/2000

ANDREW NEILL

12. Name and daytime telephone number of person to contact in the United Kingdom: ANDREW NEILL - 01344 396792

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.

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22 SEP 2000
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The Patent Office

7/77

Statement of inventorship and of right to grant of a patent

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference

2000P04860/GB/R76/AN/cs

2. Patent application number
(If you know it)

22 SEP 2000

0023270.2

3. Full name of the or of each applicant

ROKE MANOR RESEARCH LIMITED

4. Title of the invention

ACCESS AUTHENTICATION SYSTEM

5. State how the applicant(s) derived the right from the inventor(s) to be granted a patent

By provisions of contract of service and Section 39(1) (a) and (b) of the Patent Act 1977.

6. How many, if any, additional Patents Forms 7/77 are attached to this form?
(see note (c))

4

I/We believe that the person(s) named over the page (*and on any extra copies of this form)* is/are the inventor(s) of the invention which the above patent application relates to.

Signature A. Neill

Date 21/09/2000

ANDREW NEILL

8. Name and daytime telephone number of person to contact in the United Kingdom

ANDREW NEILL - 01344 396792

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e) Once you have filled in the form you must remember to sign and date it.

Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames

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Patents ADP number *(if you know it)*: 7986383001

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Patents ADP number *(if you know it)*: 7961089009

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Patents ADP number *(if you know it)*: 7986391001

Reminder

Have you signed the form?

Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames

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Patents ADP number *(if you know it)*: 7986409001

Patents ADP number *(if you know it)*:

Patents ADP number *(if you know it)*:

Reminder

Have you signed the form?

ACCESS AUTHENTICATION SYSTEM

This invention relates to access authentication systems for Wireless Local Area Networks (W-LANs), and it relates especially to such systems as can cope with the problems of user-mobility between W-LANs.

In W-LAN systems, it is often the case that a user, subscribing with one network operator (hereinafter called "the Home Operator" for that user), wishes to connect, as a "visitor", to one or more other W-LAN sites. The operator of the visited W-LAN site, however, needs to be convinced of the bona fides and credit worthiness of the visitor before permitting access to the W-LAN system and/or before supplying the visitor with certain services or information. Our previous patent application No. **(GB0022604.3; Internal No. 2000P04883GB)** envisages the visiting user basing its connection to the visited W-LAN, for charging and other operational purposes, on that user's subscription with its Home Operator. This arrangement permits a visiting user, once authenticated as a visitor with regard to a particular LAN, to revisit that LAN for as long as the appropriate user authentication with the Home Operator remains sound, without further user intervention.

This represents a significant step forward in user convenience and is achieved by virtue of the operator of each W-LAN administering home (H) network and Visitor (V) network authentication, authorisation and accounting (AAA) servers, which communicate with one another regarding the subscriber's identity and other relevant operational/charging criteria. Thus, the VAAA automatically communicates with the HAAA to derive the necessary authorisation and to organise the necessary charging, etc.

In general, however, the authentication of a new (unknown) user wishing to connect to a W-LAN system is difficult and requires the use of a third party or some direct physical communication. Even activation of a new feature of an existing subscription may require contact with the customer care department of an operator, which is an expensive and error-prone procedure. However such authentication is achieved, it ultimately becomes a question of trust, which limits current public space W-LAN operations to providing open access only.

This invention aims to reduce the problems of authentication, thus permitting a wider range of services to be provided to users, including visiting users, without compromising either the security of the networks or the ability of the network operators to ensure that they receive due payment for their services.

According to the invention there is provided an access authentication system for authenticating access to a first wireless local area network (W-LAN), the operator of which administers a visitor authentication, authorisation and accounting (VAAA) server, wherein a user requesting visiting access to the first W-LAN, and having a valid cellular mobile account, a portable computing device with a browser and a registration with a second W-LAN operator that administers a home authentication, authorisation and accounting (HAAA) server, conveys to the VAAA server, by user intervention, identity information sufficient to enable said VAAA server to communicate with said HAAA server so as to authenticate the proposed connection; said HAAA issuing a personal identification number (PIN) which is encoded and forwarded to the user's mobile telephone and transferred to the browser to authenticate the requested visiting access to the W-LAN; the cost of such access being billed to the user's cellular mobile account and the requested access being achieved via the user's browser.

By this means, the existence of the user's mobile cellular account is used by the system to provide the necessary verification of the user's identity thus encouraging the W-LAN operator to provide, for example, extra secure services to that user. The SIM card that the mobile user must

carry to operate the cellular mobile instrument thus acts as a certificate of trust between the mobile user and the network operator. Successful receipt by the user of a short message via the GSM or other short message service (SMS) addressed to the SIM is utilised to prove ownership of the SIM card, and hence identity of the user, without requiring a third party or manual intervention by the operator.

Preferably, the transfer of the PIN to the browser is effected manually by the user. Alternatively, however, it may be achieved automatically by means of software on the portable computer if this is connected to the mobile telephone. Such transfer can be effected remotely, for example by infra-red or Bluetooth, or directly by means of a cable connection.

Preferably, the PIN issued by the HAAA is encoded and forwarded to the user's mobile telephone by means of an SMS centre.

Preferably, in accordance with one aspect of the invention, the user employs the browser to convey said identity information (which may include or consist solely of a telephone number), via the first W-LAN, to the VAAA. This enables the user to set up a desired W-LAN log-on identity, and for this to be incorporated, together with the user's cellular telephone number, into the PIN. Preferably also, the PIN is combined with

masking information, and it is further preferred that the masking information is randomly derived.

Preferably, in accordance with a second aspect of the invention, the user calls the VAAA on the mobile telephone to provide said identity information. In this case, the subject telephone call may be routed to the HAAA through a premium rate call unit.

In order that the invention may be clearly understood and readily carried into effect, certain embodiments thereof will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 shows, in schematic form, the operation of a system in accordance with one embodiment of the invention; and

Figure 2 shows, in similar form, the operation of a system in accordance with a second embodiment of the invention.

Referring now to Figure 1, there is shown schematically the operation of a system in accordance with one example of the invention; it being assumed at the outset that a visiting user wishing to connect to a W-LAN has a valid cellular mobile account, a portable device, such as a WAP

telephone or a UMTS terminal, with appropriate computing capability, having a suitable W-LAN interface and HTTP-compliant browser.

Upon entering the W-LAN, indicated generally at 1, an introductory web page 2 is displayed on the browser of the portable device. This page 2 requests (at 3) insertion of a desired W-LAN identity, selected by the user, together with that of the home network operator (telco-h) with whom that user subscribes, and (at 4) the user's cellular telephone number. Instead of the user's cellular number, any other information sufficient to identify the user's cell phone account could be used.

The entered information is combined with a randomly derived masking data string and sent across the W-LAN to a local service selection gateway (SSG) 5 using a secure communication protocol, such as may be incorporated into the browser of the portable device.

The SSG 5 forwards the transmitted information to the local visitor AAA unit 6 owned by the operator, "telco-v" of the visited W-LAN, and thence to a telephony/Internet gateway 7 which utilises the information it receives to identify the mobile user's home AAA and sends the information to the home AAA, 8, which is operated of course by the user's home network operator, telco-h.

Telco-h establishes a W-LAN account for the user, which account is billed to the user's existing cellular account, although the subject charges are preferably made the subject of a separate entry list under the account so that they can be readily identified. In addition, at this stage, the home AAA, 8, generates a PIN, which is then encoded with the original masking data string and passed to a local short message service centre (SMSC), 9. The cellular mobile system then relays the message to the appropriate location, where it is received at the handset 10 of the mobile user, who manually transfers the encoded string from the message into the portable device, thus validating the W-LAN account creation process. Alternatively, the encoded string may be transferred automatically subject to the provision of a suitable data connection.

The above transaction can alternatively be achieved, if desired, by means including an infra-red (IR) link, short range wireless access device or by means of an extended cellular receiver unit embedded within the mobile user's portable device.

It is to be noted that the mobile user does not need to know individually the masking string and the PIN allocated by telco-h, only their combination.

If necessary, access for the mobile user to all or selected services on the visited W-LAN may be barred once the true identity of the home AAA 8 has been identified if, for example, it turns out to be a hostile regime, to be a bogus entry or to have a zero credit rating.

The operation of an alternative system, in accordance with a second embodiment of the invention, will now be described with reference to Figure 2.

In this alternative system, a registration number is freely given to the visiting mobile user at entry to the W-LAN. The registration number may, for example, be displayed on a poster or a screen, or contained on a freely distributed leaflet or in a web page set up to act as a default page for unregistered users of the W-LAN.

The user's cellular mobile device is employed to contact a premium rate service and then enter the (public) registration number, which will then register the user with the W-LAN in a similar manner to that described above with respect to Figure 1. Once the call is completed, the mobile user receives an SMS message, as described above, so completing the authentication process. In this case, the content of the message may be time-stamped and linked to the local access point and user identity, to prevent re-use or sharing of access.

Referring now specifically to Figure 2, in which components identical with or functionally equivalent to those shown in Figure 1 carry the same reference numbers, the user rings a premium rate number, using the mobile device 10, entering the public registration number to register with the W-LAN. The local visitor AAA, 6, routes this call to a premium rate call unit 11 which then sends the information to the home AAA, 8. The operator telco-h which owns this home AAA then establishes a W-LAN account for the user, billed, as before, to the existing cellular account for the mobile device 10.

A PIN is generated from this initialisation which is then encoded with the registration number sent from the user and passed to the local SMSC, 9. The cellular mobile system then relays the message to the appropriate location, where it is received by the mobile user on the handset, 10.

The user is then required to manually transfer the encoded data string (i.e. the string comprising the PIN encoded with the registration number) into the portable device with computing capability, thereby validating the WLAN account creation process.

As before, this transaction can alternatively be achieved by means of an infra-red link, short range wireless access or an embedded cellular receiver unit inside the mobile user's portable device.

The web page is used to provide the data string to the LAN, to authenticate the access and then start encryption since it can then easily be user-specific, without the user needing to provide, for example, a MAC address.

It will be appreciated that the system of Figure 2 is purely telephony network based. Advantageously, the network operator (telco-v) does not need to have web-based forms up and running to operate the system of Figure 2. Moreover, the system of Figure 2 generates revenue (or pre-payment revenue) via the premium access phone call, thus decoupling billing functionality from the W-LAN itself. This revenue can be automatically shared between the premium rate service provider and the W-LAN operator.

Although the invention has been described with regard to particular embodiments thereof, it is not intended that the scope of the claims of this application be limited to those embodiments, and alternative arrangements will be evident in many respects to those skilled in the art.

CLAIMS:

1. An access authentication system for authenticating access to a first wireless local area network (W-LAN), the operator of which administers a visitor authentication, authorisation and accounting (VAAA) server, wherein a user requesting visiting access to the first W-LAN, and having a valid cellular mobile account, a portable computing device with a browser and a registration with a second W-LAN operator that administers a home authentication, authorisation and accounting (HAAA) server, conveys to the VAAA server, by user intervention, identity information sufficient to enable said VAAA server to communicate with said HAAA server so as to authenticate the proposed connection; said HAAA issuing a personal identification number (PIN) which is encoded and forwarded to the user's mobile telephone and transferred to the browser to authenticate the requested visiting access to the W-LAN; the cost of such access being billed to the user's cellular mobile account and the requested access being achieved via the user's browser.

2. A system according to Claim 1 wherein the transfer of the PIN to the browser is effected manually by the user.

3. A system according to Claim 1 wherein the portable computing device is coupled to the mobile telephone and the transfer of the PIN to the browser is effected automatically by means including software supported by the portable computing device.

4. A system according any preceding claim, wherein the PIN issued by the HAAA is encoded and forwarded to the user's mobile telephone by means of a short message service centre.

5. A system according to any preceding claim, wherein the user employs the browser to convey said identity information, via the first W-LAN, to the VAAA.

6. A system according to any preceding claim wherein the PIN is combined with masking information.

7. A system according to Claim 6 wherein said masking information is randomly derived.

8. A system according to any of claims 1 to 4 inclusive, wherein the user calls the VAAA on the mobile telephone.

9. A system according to Claim 8 wherein the telephone call from said user is routed to the HAAA through a premium rate call unit.

10. An access authentication system substantially as herein described with reference to and/or as shown in the accompanying drawings.

ACCESS AUTHENTICATION SYSTEM

An access authentication system is provided for authenticating access for visitors to a wireless local area network (W-LAN), the operator of which administers a visitor authentication, authorisation and accounting (VAAA) server. A user requesting visiting access to the W-LAN, is required to have a valid cellular mobile account, a portable computing device with a browser and a valid W-LAN card from another operator that administers a home authentication, authorisation and accounting (HAAA) server. The user, on requesting visiting access to the W-LAN, inputs, via the VAAA server, identity information that enables the HAAA to issue a personal identification number (PIN) which is encoded and forwarded, preferably by way of a short message service (SMS), to the user's mobile telephone. This encoded PIN is transferred to the browser to authenticate the requested visiting access to the W-LAN, and the costs associated with such access are billed to the user's cellular mobile account; the requested access being achieved via the user's browser. The user may employ the browser to convey the identity information, via the W-LAN, to the VAAA. Alternatively, the user may call the VAAA on the mobile telephone to provide said identity information, in which case, the subject telephone call is preferably forwarded to the HAAA via a premium rate call unit.

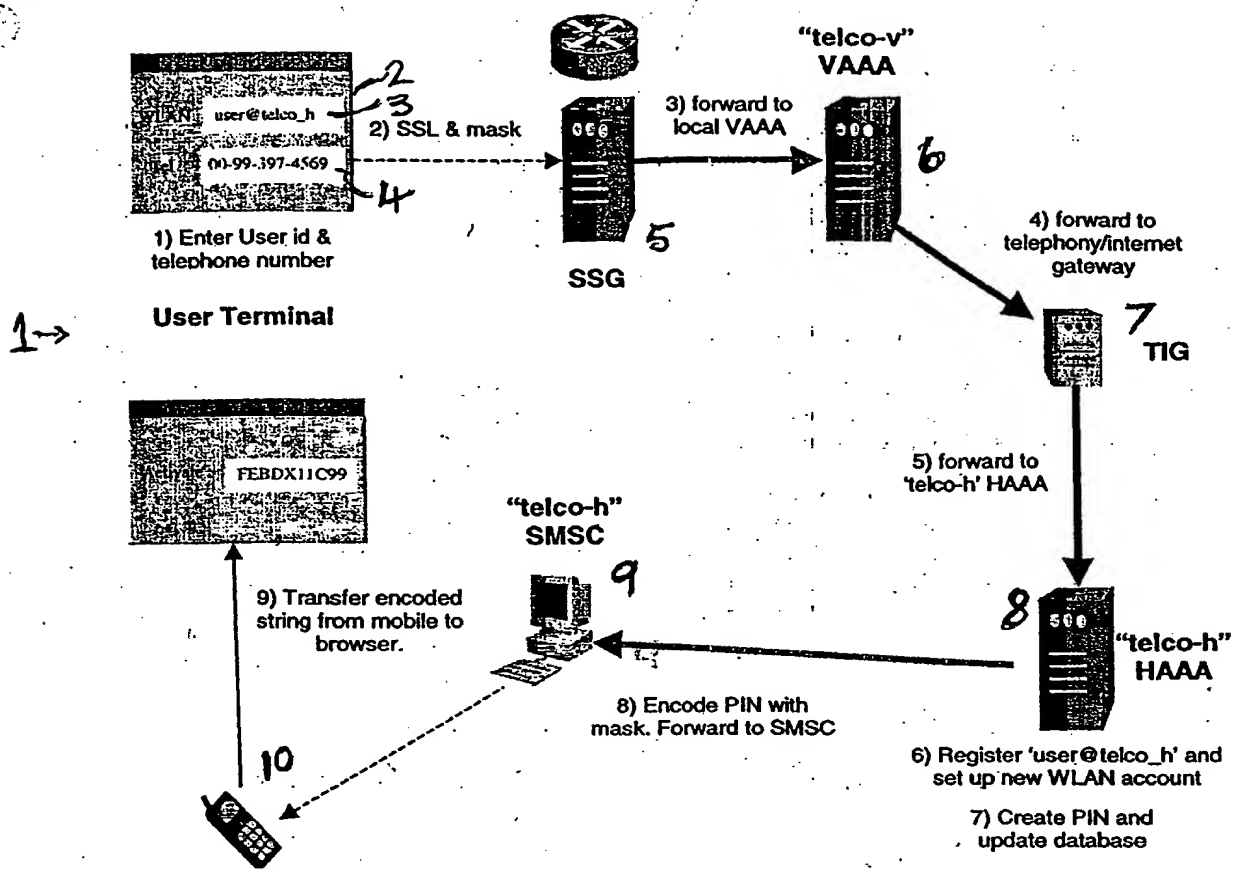
"telco-v"
VAAA
user@telco_h
00-99-397-4569
2) SSL & mask
3) forward to
local VAAA
1) Enter User id &
telephone number
User Terminal
SSG
4) forward to
telephony/internet
gateway
TIG
FEBDX11C99
5) forward to
'telco-h' HAAA
"telco-h"
SMSC
9) Transfer encoded
string from mobile to
browser.
"telco-h"
HAAA
8) Encode PIN with
mask. Forward to SMSC
6) Register 'user@telco_h' and
set up new WLAN account
7) Create PIN and
update database

Figure 1

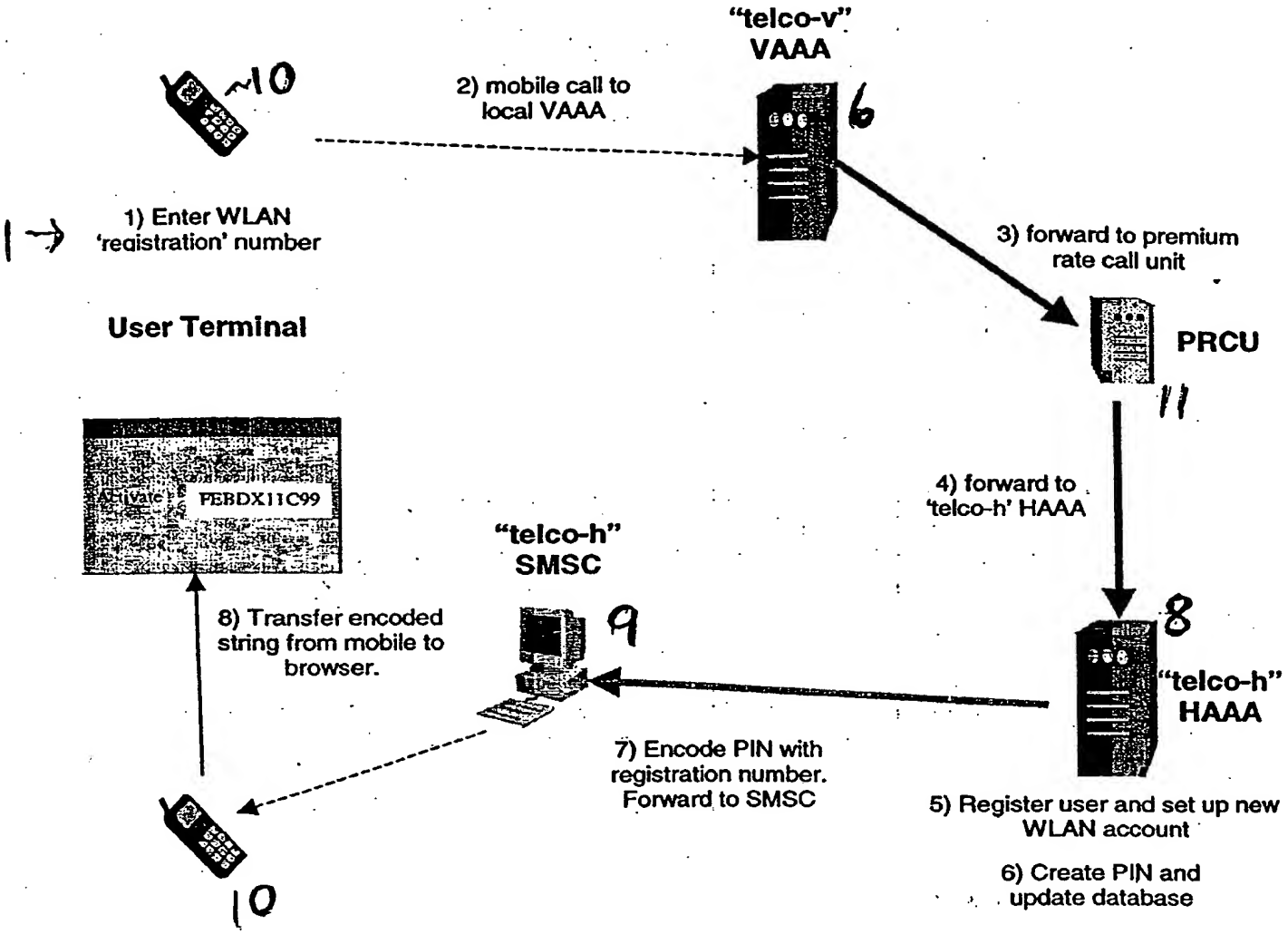
"telco-v"
VAAA
~10
2) mobile call to
local VAAA
6
1) Enter WLAN
'registration' number
User Terminal
3) forward to premium
rate call unit
PRCU
11
Activate
PEBDX11C99
4) forward to
'telco-h' HAAA
"telco-h"
SMSC
8) Transfer encoded
string from mobile to
browser.
9
8
"telco-h"
HAAA
7) Encode PIN with
registration number.
Forward to SMSC
5) Register user and set up new
WLAN account
6) Create PIN and
update database
10

Figure 2